G PROBLEM SOLVING WITH VENN DIAGRAMS

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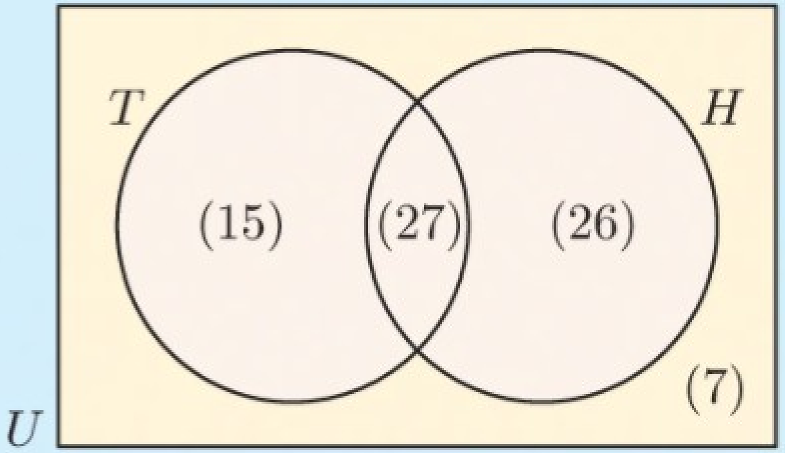
Example 12 **Self Tutor**

The Venn diagram alongside illustrates the number of people in a sporting club who play tennis (T) and hockey (H).



Determine the number of people:

- **a** in the club
- **b** who play hockey
- **c** who play both sports
- **d** who play neither sport
- **e** who play at least one sport.

a $n(U) = 15 + 27 + 26 + 7 = 75$

There are 75 people in the club.

b $n(H) = 27 + 26 = 53$

53 people play hockey.

c $n(T \cap H) = 27$

27 people play both sports.

d $n(T' \cap H') = 7$

7 people play neither sport.

e $n(T \cup H) = 15 + 27 + 26 = 68$

68 people play at least one sport.

1 The Venn diagram alongside illustrates the number of students in a particular class who study French (F) and Spanish (S).

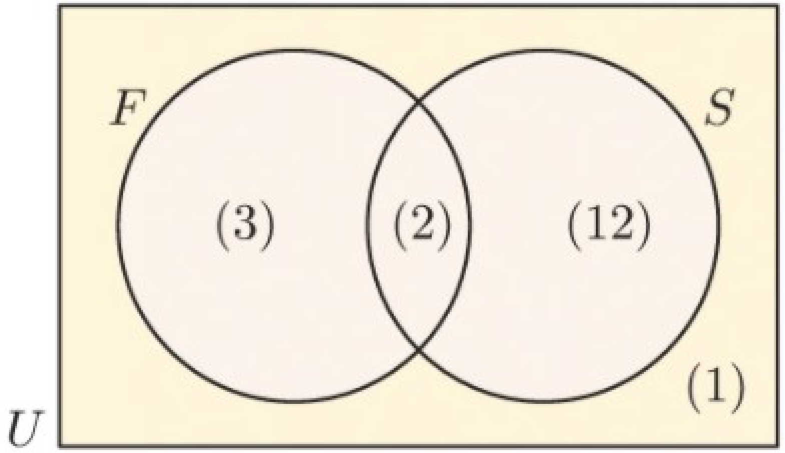
Determine the number of students:

a in the class

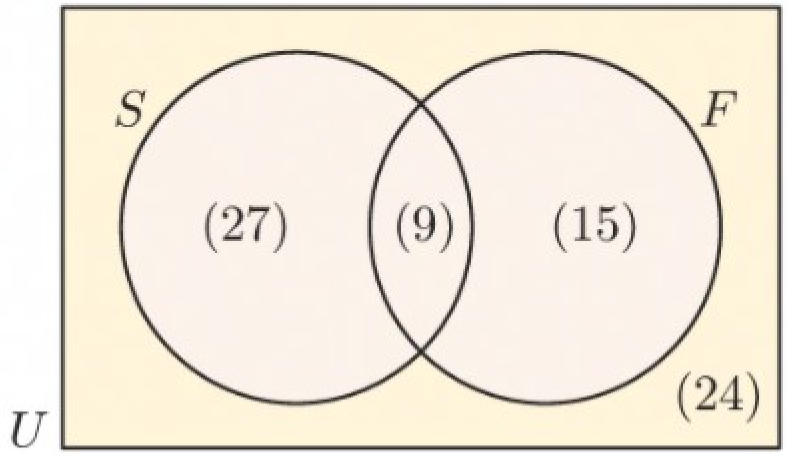
b who study both subjects

c who study at least one of the subjects

d who only study Spanish.



2 In a survey at a resort, people were asked whether they went sailing (S) or fishing (F) during their stay.



Use the Venn diagram to determine the number of people:

- **a** in the survey
- **b** who did both activities
- **c** who did neither activity
- **d** who did exactly one of the activities.

3 In a class of 30 students, 19 study Physics, 17 study Chemistry, and 15 study both subjects. Determine the number of students who study:

a at least one of the subjects
b Physics, but not Chemistry
c exactly one of the subjects
d neither subject.

4 In a class of 40 students, 19 play tennis, 20 play netball, and 8 play neither sport. Determine the number of students in the class who:

a do not play netball
b play at least one of the sports
c play exactly one of the sports
d play netball, but not tennis.

5 In a class of 25 students, 15 play hockey, 16 play basketball, and 4 play neither sport. Determine the number of students who play:

a both sports
b hockey but not basketball.

6 In a class of 40 students, 34 like bananas, 22 like pineapples, and 2 dislike both fruits. Find the number of students who:

a like both fruits
b like at least one fruit.

7 In a class of 40 students, 23 have dark hair, 18 have brown eyes, and 26 have dark hair, brown eyes or both. How many students have:

a dark hair and brown eyes
b neither dark hair nor brown eyes
c dark hair but not brown eyes?

8 Answer the **Opening Problem** on page **28**.

9 In a circle of music lovers, 14 people play the piano or violin, 8 people are piano players, and 5 people play both instruments. Find the number of violin players.

10 64% of students at a school study a language, and 79% study Mathematics. Every student studies at least one of these subjects. What percentage of students study both a language and Mathematics?

11 Our team scored well in the interschool athletics carnival. Each person was allowed to participate in one running and one jumping event. We gained 8 places in running events. 5 of us gained a place in both running and jumping events, and 14 of us gained exactly one place. In total, how many places were gained by the team?

12 At a certain school there are 90 students studying for their IB diploma. They all study at least one of the subjects Physics, French, or History. 50 are studying Physics, 60 are studying French, and 55 are studying History. 30 students are studying both Physics and French, while 10 students are studying both French and History but not Physics. 20 students are studying all three subjects.

- **a** Construct a Venn diagram to illustrate this information.
- **b** How many students are studying both Physics and History, but not French?
- **c** How many students are studying at least two of the three subjects?

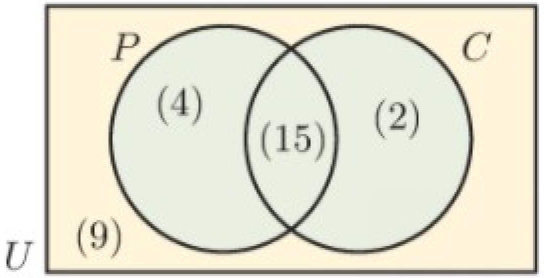
13 In a school of 405 pupils, a survey on sporting activities shows that 251 pupils play tennis, 157 play hockey, and 111 play softball. There are 45 pupils who play both tennis and hockey, 60 who play hockey and softball, and 39 who play tennis and softball. What conclusion may be drawn about the number of students who participate in all three sports?

EXERCISE 2G

1 **a** 18 **b** 2 **c** 17 **d** 12

2 **a** 75 **b** 9 **c** 24 **d** 42

3



a 21 **b** 4
c 6 **d** 9

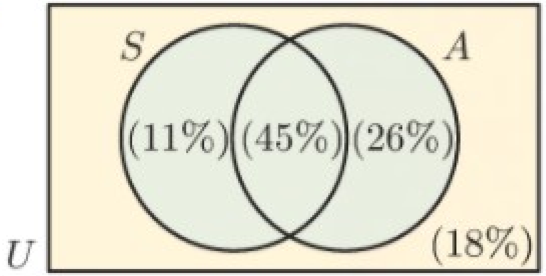
4 **a** 20 **b** 32 **c** 25 **d** 13

5 **a** 10 **b** 5

6 **a** 18 **b** 38

7 **a** 15 **b** 14 **c** 8

8 **a**



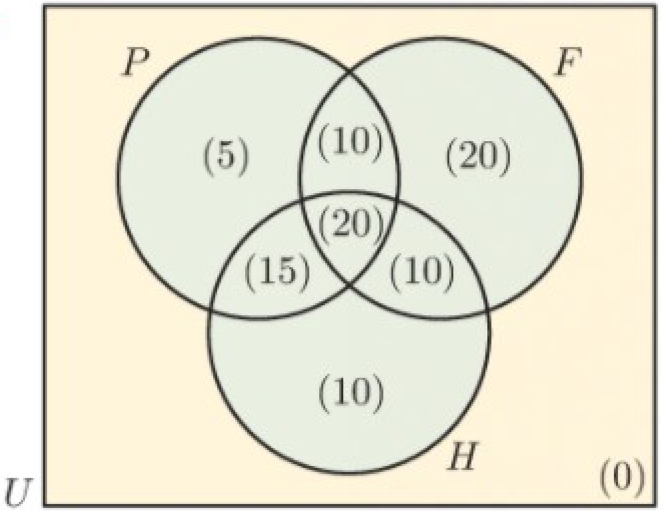
b **i** 45%
ii 82%
iii 11%
iv 37%

9 11 violin players

10 43%

11 19 places

12 **a**



b 15 students

c 55 students

13 The number who participate in all three sports must be less than or equal to 30.